

REMARKS/ARGUMENTS

In the Office action dated July 7, 2005, the Examiner rejected claims 1-9, all of the claims in the Application, under 35 U.S.C. § 112, 2d paragraph. The Examiner did not apply any art in a 35 U.S.C. § 102 or 35 U.S.C. § 103(a) rejection.

In the Specification, No Changes

In the Claims, claims 1, 2 and 6 are amended; claim 9 is cancelled, the limitations thereof being incorporated into claim 6.

The Invention

The invention is a method of forming a silicon-on-nothing (SON) devices by forming an air gap through selective etching of a SiGe layer. As CMOS IC technology enters the sub-50nm range, the silicon channel and the buried oxide thicknesses must be less than 50 nm and 100 nm, respectively, in order to prevent the short channel effect (SCE). The method of the invention of fabrication of silicon-on-nothing (SON) MOSFET using selective etching of $\text{Si}_{1-x}\text{Ge}_x$ layer, includes preparing a silicon substrate; growing an epitaxial $\text{Si}_{1-x}\text{Ge}_x$ layer on the silicon substrate; growing an epitaxial thin top silicon layer on the epitaxial $\text{Si}_{1-x}\text{Ge}_x$ layer; trench etching of the top silicon and $\text{Si}_{1-x}\text{Ge}_x$ into the silicon substrate to form a first trench; selectively etching the $\text{Si}_{1-x}\text{Ge}_x$ layer to remove substantially all of the $\text{Si}_{1-x}\text{Ge}_x$ to form an air gap; depositing a layer of SiO_2 by CVD to fill the first trench; trench etching to form a second trench; selectively etching the remaining $\text{Si}_{1-x}\text{Ge}_x$ layer; depositing a second layer of SiO_2 by CVD to fill the second trench, thereby decoupling a source, a drain and a channel from the substrate; and completing the structure by state-of-the-art CMOS fabrication techniques, which are well known to those of ordinary skill in the art.

The Rejections

The Examiner has rejected all of the claims under 35 U.S.C. § 112, 2d paragraph. Specifically, the Examiner states that the steps of “removing substantially all of the SiGe layer” followed by a step of removing the remaining SiGe layer is confusing and contradictory. The Examiner further states that the element of “completing the structure...” is vague and indefinite. Finally, the Examiner states that “critical thickness” is vague and indefinite, even though the parameters for what constitutes a critical thickness are provided in the Specification and claims.

The Claims

Claim 1 has been amended in an attempt to overcome the 35 U.S.C. § 112, 2d paragraph rejection. Specifically, although Applicants contend that removing substantially all of a layer implicitly means that some of the layer remains, and is subsequently removed, the claim has been amended to remove the offending language, and now recites that “a portion” of the SiGe layer is initially removed, and then subsequently, the remaining SiGe layer is removed. The Specification and drawings describe this portion of the method of the invention at page 6, lines 3-10 and Fig. 6; and page 6, line 22 to page 7, line 5 and Fig. 10. This amendment should result in this portion of the 35 U.S.C. § 112, 2d paragraph rejection being withdrawn.

The step of “completing the structure by state-of-the-art CMOS fabrication techniques” is well known to those of ordinary skill in the art. The Examiner is requested to remove the 35 U.S.C. § 112, 2d paragraph rejection to this element of the claim, which should result in allowance of the claim as currently amended.

Claim 2 has been amended to correct a typographic error as to the critical thickness, and to move the definition of critical thickness from the end of the sentence to a

location immediately following the limitation of critical thickness. The support for this is found in the Specification, page 5, lines 1-7. Claim 2 should be allowable as amended.

Claims 3-5 were not specifically rejected, and are assumed to now be allowable, the 35 U.S.C. § 112, 2d paragraph rejections to their parent claim having been overcome.

Claim 6 has been amended along the lines of claim 1, and has further had limitations from claim 9 inserted therein to define “critical thickness.” The step of “completing the structure....” has been deleted, rendering the claim, as amended, allowable over the 35 U.S.C. § 112, 2d paragraph rejection.

Claims 7 and 8 are allowable as their parent claim is no longer rejected under 35 U.S.C. § 112, 2d paragraph.

In light of the foregoing amendment and remarks, the Examiner is respectfully requested to reconsider the rejections and objections stated in the Office action, and pass the application to allowance. If the Examiner has any questions regarding the amendment or remarks, the Examiner is invited to contact the undersigned.

Provisional Request for Extension of time in Which to Respond

Should this response be deemed to be untimely, Applicants hereby request an extension of time under 37 C.F.R. § 1.136. The Commissioner is hereby authorized to charge any